

Instruction Manual

The Mega-Pix

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**KAY ELECTRIC Co.
PINE BROOK, N. J.**

INSTRUCTION MANUAL

THE MEGA-PIX

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SECTION I

INTRODUCTION

1.1 Description

The MEGA-PIX is a twelve-channel crystal-controlled television r.f. picture and sound signal source designed for rapid and accurate production line testing of television receivers. It will deliver a crystal-controlled, amplitude modulated, double sideband picture carrier on each of the twelve V.H.F. television channels when supplied with a standard television video signal. At the same time the unit will deliver a crystal-controlled frequency modulated sound carrier for each television channel.

1.2 Specifications

1. Output signal frequencies: television r.f. picture and sound frequencies, channels 2 to 13 inclusive.
2. Accuracy of picture carrier frequencies: .01%
3. Separation of picture and sound carriers: 4.5 mc $\pm$ 500 c.p.s.
4. Maximum picture carrier output: at least 30,000 microvolts into open circuit, (essentially constant from channel to channel).
5. Amplitude control range: continuously variable over 20 db range.
6. R.F. output impedance level: 72 ohms
7. Video input impedance level: 72 ohms
8. Video input signal required: 2 volts peak-to-peak black negative
9. Video amplifier band-width: flat to at least 3.5 megacycles
10. Picture carrier modulation percentage: continuously variable from 0 to over 95%, with modulation level substantially constant from channel to channel.
11. Sound carrier deviation: continuously variable from 0 to 20 kc.
12. Sound modulating frequency: approximately 2000 c.p.s.
13. Power requirements: 105 to 125 volts, 50 to 60 c.p.s., approximately 90 watts.

14. Tubes: 3 type 6AG5, 3 type 6BH6, 1 type 6AK5, 1 type 6AS6, 1 type 6SN7GT, 1 type 5Y3GT, 1 type 6Y6G, 1 type 6SL7GT, 1 type OD3/VR150

15. Crystals: 3 type 1N34

16. Dimensions: 17" W. x 9" H. x 12" D.

17. Weight: 27 pounds

1.3 Purpose

The MEGA-PIX is designed for rapid production-line testing of television receivers. When supplied with a standard television video signal (e.g., from a monoscope, TV camera chain, or a receiver tuned to a TV station) it will provide a modulated picture carrier suitable for use as a "final air check" signal. This signal is available on each of the twelve TV channels, individually and rapidly selectable by means of a front panel switch. At the same time, a frequency-modulated sound carrier signal is provided on each channel so that sound "tune-up" and overall operation of the TV receiver may be checked.

The unit is also useful as an accurate source of picture and sound carrier marker signals for use with the MEGA-SWEEP in making visual alignment and bandwidth checks of TV receiver, tuners, and boosters.

1.4 General Circuit Description

The basic circuits of the MEGA-PIX (schematic diagram, Fig. 2) are shown in block diagram in Fig. 1. They are comprised of:

1. Picture carrier source
2. Sound carrier source
3. Video amplifier
4. Regulated power supply

The picture carrier source consists of a twelve channel crystal-controlled Colpitts type oscillator (6BH6), frequency multiplier (1N34), and output amplifier circuit arrangement (6AK5) for developing the r.f. picture carrier on each TV channel. The crystal-controlled carriers are generated in the 6BH6 oscillator and doubled or tripled (low and high bands respectively) by means of the oscillator plate tuned circuits. The 1N34 crystal increases the relative amplitude of the selected harmonics, which are further frequency multiplied by the tuned circuits in the grid circuit of the 6AK5 r.f. amplifier. After amplification the waveforms containing the carriers are sharpened and the spurious frequencies reduced by means of the tuned circuits in the plate circuit of the 6AK5.

The picture carrier thus developed is then fed to a pair of modulator stages. The first of these is a 6AS6 pentode which suppressor modulates the picture carrier on a double sideband basis and feeds the modulated signal to the r.f. output control across a plate compensating coil which maintains relatively constant picture carrier amplitude on all TV channels.

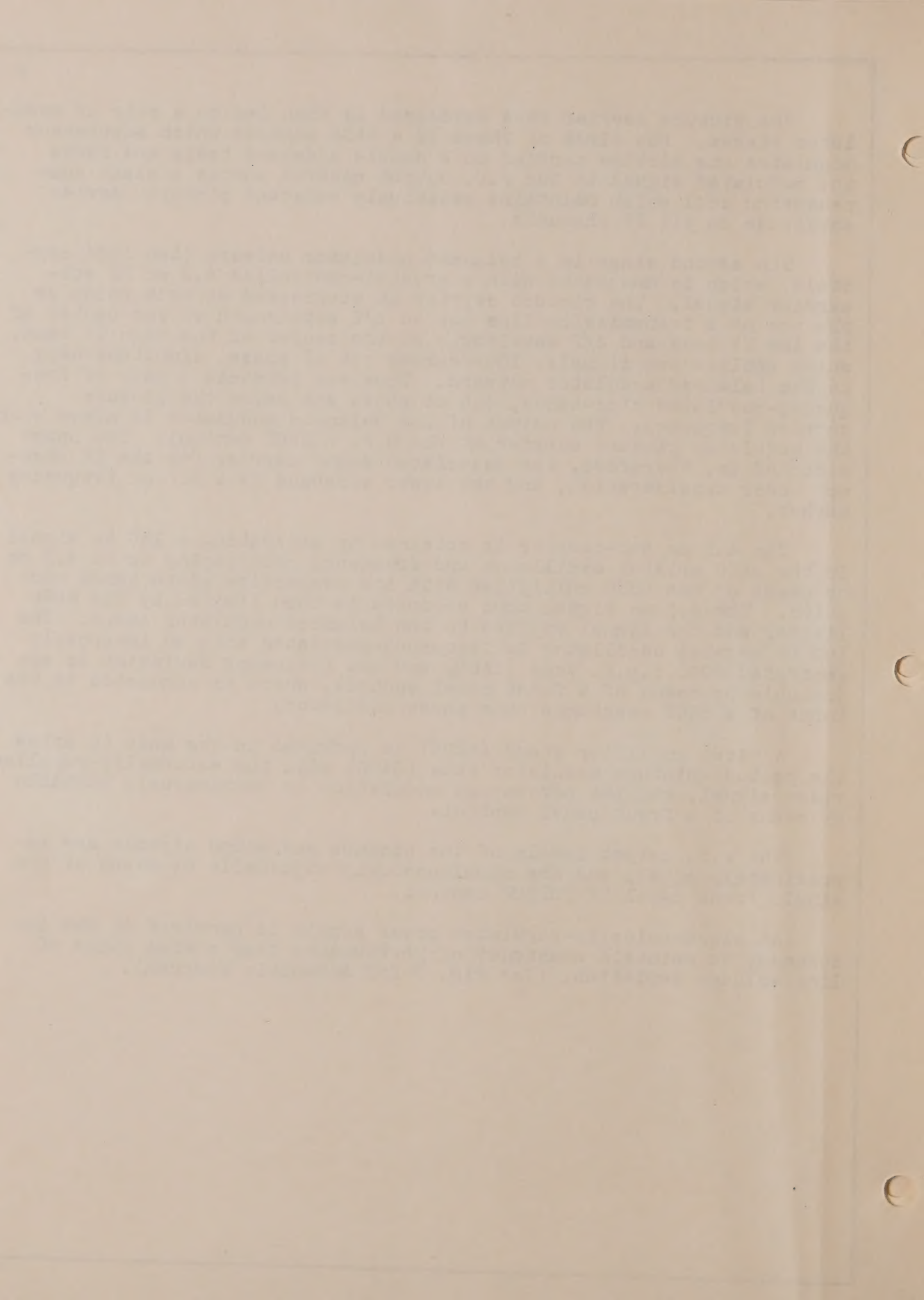
The second stage is a balanced modulator network (two 1N34 crystals) which is modulated with a crystal-controlled 4.5 mc FM sub-carrier signal. The picture carrier is suppressed at this point by the use of a transmission line cut to $1/2$ wavelength at the center of the low TV band and $3/2$ wavelength at the center of the high TV band, which applies two signals, 180 degrees out of phase, simultaneously to the balanced modulator network. Thus are produced a pair of frequency-modulated side-bands, 4.5 mc above and below the picture carrier frequency. The output of the balanced modulator is mixed with the modulated picture carrier at the R.F. OUTPUT control. The upper sideband is, therefore, the associated sound carrier for the TV channel under consideration, and the lower sideband is a 4.5 mc frequency marker.

The 4.5 mc sub-carrier is obtained by generating a 180 kc signal in the 6AG5 crystal oscillator and frequency multiplying up to 4.5 mc by means of the 6SN7 multiplier with its respective plate tuned circuits. The 4.5 mc signal thus produced is then limited by the 6BH6 limiter and the signal applied to the balanced modulator stage. The 180 kc crystal oscillator is frequency-modulated with an internally generated 2000 c.p.s. tone (6AG5), and the frequency deviation is adjustable by means of a front panel control, which is connected to the input of a 6AG5 reactance tube phase modulator.

A video amplifier stage (6BH6) is provided in the unit to drive the pentode picture modulator tube (6AS6) with the externally-supplied video signal, and the percentage modulation is continuously variable by means of a front panel control.

The r.f. output levels of the picture and sound signals are approximately equal, and are simultaneously adjustable by means of the single front panel RF OUTPUT control.

An electronically-regulated power supply is provided in the instrument to maintain constancy of performance over a wide range of line voltage variation. (See Fig. 3 for schematic diagram).



SECTION II

OPERATING INSTRUCTIONS

2.1 Preliminary

The space inside the top cover of the instrument is packed with tissue paper to protect the tubes during shipment. This packing should be removed before operating the unit.

2.2 Power Input

The instrument should be connected to the 117 volt, 50 to 60 c.p.s. line. The power consumption is approximately 90 watts.

2.3 Controls

A. General

Reference should be made to the instrument front panel or to the schematic diagram (Fig. 2). Switch ON-OFF is a toggle switch which controls the 117 volt AC power. A pilot light indicates the presence of the 117 volt AC power and a 3 amp. fuse is replaceable from the front panel.

B. DEVIATION control

The DEVIATION control is a potentiometer (R39 in Fig. 2) which varies the frequency excursion of the sound carrier at the RF OUTPUT.

A switch is mounted on the DEVIATION control potentiometer shaft which permits the B_f voltage to the 4.5 mc FM sub-carrier section to be dis-connected when the operator desires that only a picture carrier signal be available.

C. MODULATION control

The MODULATION control is a potentiometer (R30 in Fig. 2) which varies the amount of grid signal applied to the video amplifier and thus controls the percentage picture modulation.

D. RF OUTPUT control

The RF OUTPUT control is a potentiometer mounted across the output connector and controls the picture and sound carrier levels simultaneously.

2.4 Connectors

1. VIDEO INPUT connector

This is a VHF type female connector provided for connection of the incoming video signal (73 ohm cable).

2. RF OUTPUT connector

This is a VHF type female connector provided for connection to the TV receiver under test (73 ohm cable).

2.5 Operating Data

To operate the MEGA-PIX, the power cord is plugged into a 117 volt, 50 to 60 cycle, AC outlet and the POWER switch turned ON. Video signal of approximately 2 volt peak-to-peak amplitude and of "negative black" polarity is connected to the 72 ohm VID. IN. coaxial connector. The TELEVISION CHANNEL switch is set to the desired channel and r.f. output is taken from the R.F. OUTPUT coaxial connector through a length of 72 ohm coaxial cable to the receiver under test. This cable should be properly terminated in its characteristic impedance for satisfactory results. If the receiver is of the 300 ohm balanced input type, a suitable transformer or resistive matching pad should be used. Tune the TV receiver under test to the desired channel (the same channel to which the MEGA-PIX is set), and, once the picture is observed, adjust the MODULATION control until the desired depth of picture modulation is obtained. Over-modulation is evidenced by "blurring" or "blooming" of the picture, often accompanied by a "negative" picture effect and sync. instability of the TV receiver. Adjust the DEVIATION control until the desired intensity of 2000 cycle tone is heard, and adjust the RF OUTPUT control for the desired strength of r.f. picture and sound carriers. Once these adjustments are made for a particular TV channel they should hold reasonably well for all other channels.

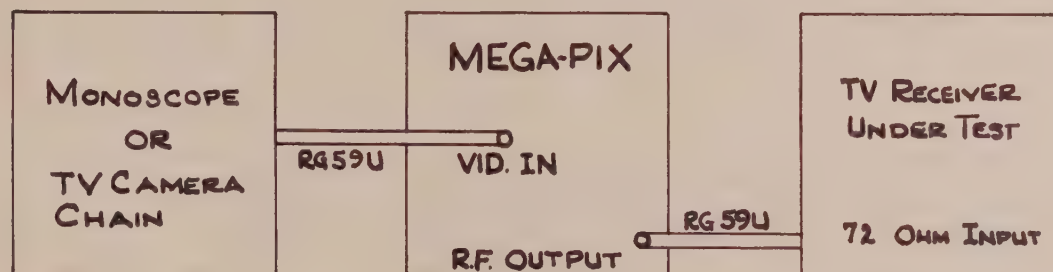
SECTION III

APPLICATIONS

3.1 Production Line Tests

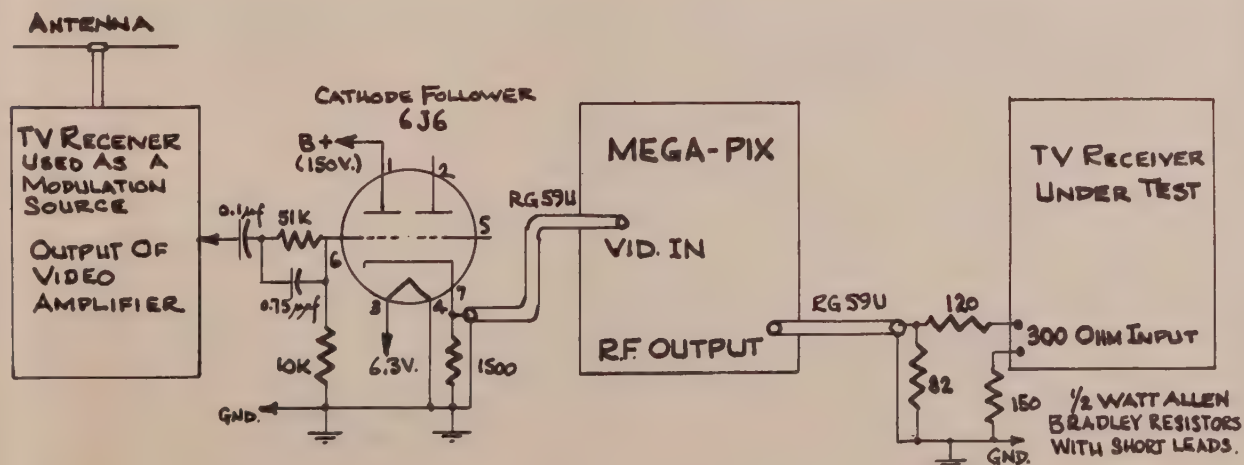
The MEGA-PIX is intended primarily for use in production line testing of television receivers. When supplied with a standard TV video signal (e.g., from a monoscope, TV camera chain, or a TV receiver tuned to a station) of 2 volts peak-to-peak amplitude (black negative) across 72 ohms, the MEGA-PIX will deliver a crystal-controlled, amplitude modulated, double sideband picture carrier on each of the twelve VHF television channels, with associated crystal-controlled sound carriers for each channel.

The following arrangement may be used:



Production line test with a monoscope or TV camera chain as external video modulation sources for the MEGA-PIX.

When a TV receiver tuned to a station is used as the video modulation source, the following arrangement should be used.



Production line test with a TV receiver used as an external video modulation source for the MEGA-PIX.

A cathode follower is used as an impedance matching connection between the TV receiver video amplifier output and the MEGA-PIX video input. Connect the grid circuit of the cathode follower to the CR tube side of the video amplifier plate coil. Connect the B₊ lead to a source of well by-passed B₊ voltage not exceeding 150 volts (for the 6J6). If a higher B₊ source voltage is available, use an external resistance in series with the B₊ lead and the source, and connect a 20 uf, 450 v. capacitor to the B₊ side of the added resistance. Connect the ground lead to a good chassis ground on the TV receiver, the filament lead to any available filament supply of 6.3 v. ac., and plug the output of the cathode follower (RG59U cable) into the video input of the MEGA-PIX.

The antenna lead is used as an impedance matching connection between the MEGA-PIX and a TV receiver with a 300 ohm input. Plug the antenna connector in the R.F. output of the MEGA-PIX and the two resistors to the input of a 300 ohm input TV receiver (for other inputs use correct terminating resistances). Ground the black lead to any convenient chassis point.

The contrast controls on both TV receivers, along with the modulation control on the MEGA-PIX have to be adjusted to obtain the best test results, for proper contrast and definition.

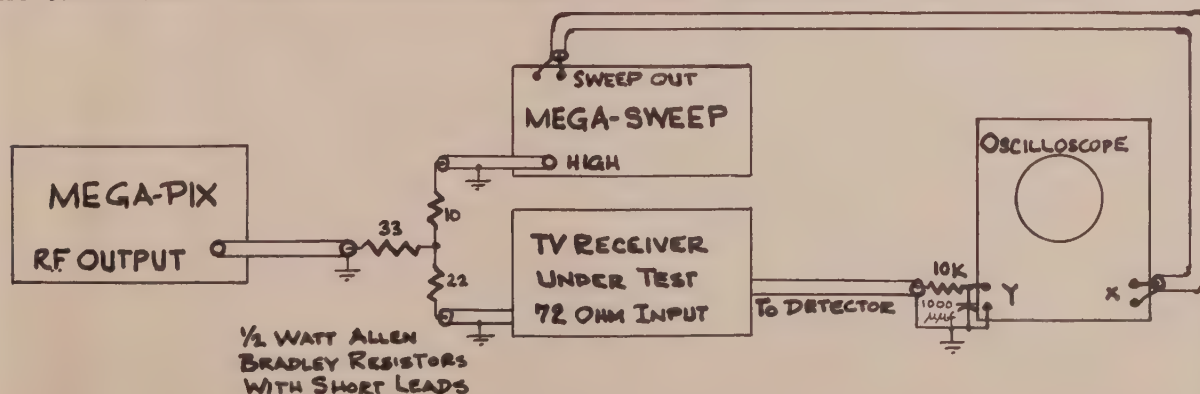
3.2 Visual Alignment Tests

In visual alignment work with the MEGA-SWEEP and a standard oscilloscope the MEGA-PIX (with the slight modification shown below) may be used to produce precise markings on the displayed response of TV receivers, tuners, or boosters and in the case of TV receivers, may be used to trim the local oscillator.

The f.m. sound carriers may be used for sound "tune-up" of TV receivers and overall operation checks.

The MEGA-PIX may also be used to provide precise frequency markers on the display of reflected energy obtained with the MEGA-MATCH.

When the MEGA-PIX is used as a source of precise frequency markers the MEGA-SWEEP should be connected to the instrument as follows:



MEGA-PIX used in visual alignment tests.

A modified "T" connector, including the T-pad resistances shown above, could be used to aid in the simplification of making lead connections.

If a TV receiver other than that with a 72 ohm input is used the proper coaxial-to-balanced resistor pad should be used.

When feeding the oscilloscope from a detector a low pass filter (1000 mmf shunt condenser and a 10,000 ohm series resistor) should be used for isolation and sharpening of the birdie marker.

Picture Carrier Source

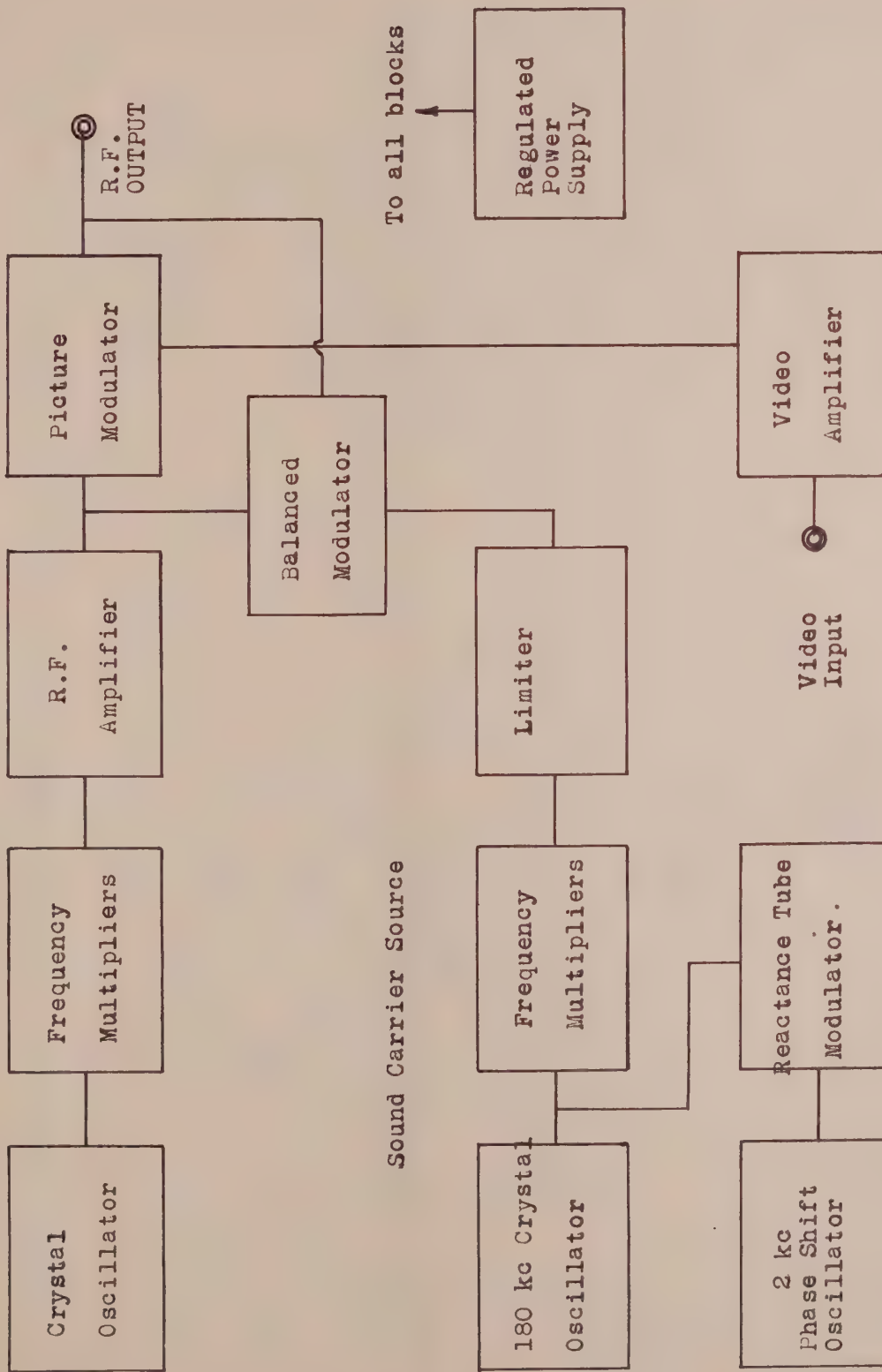
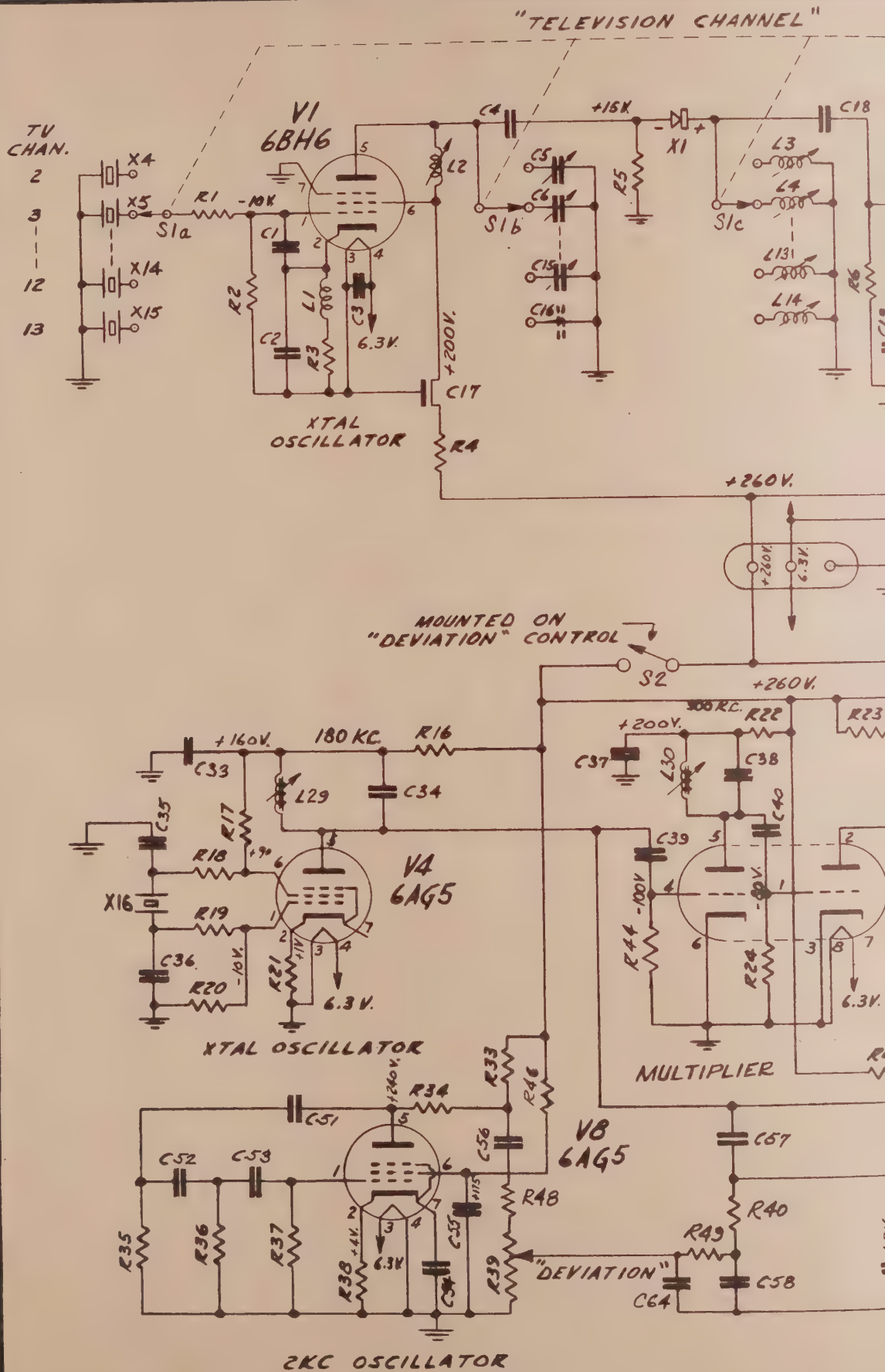
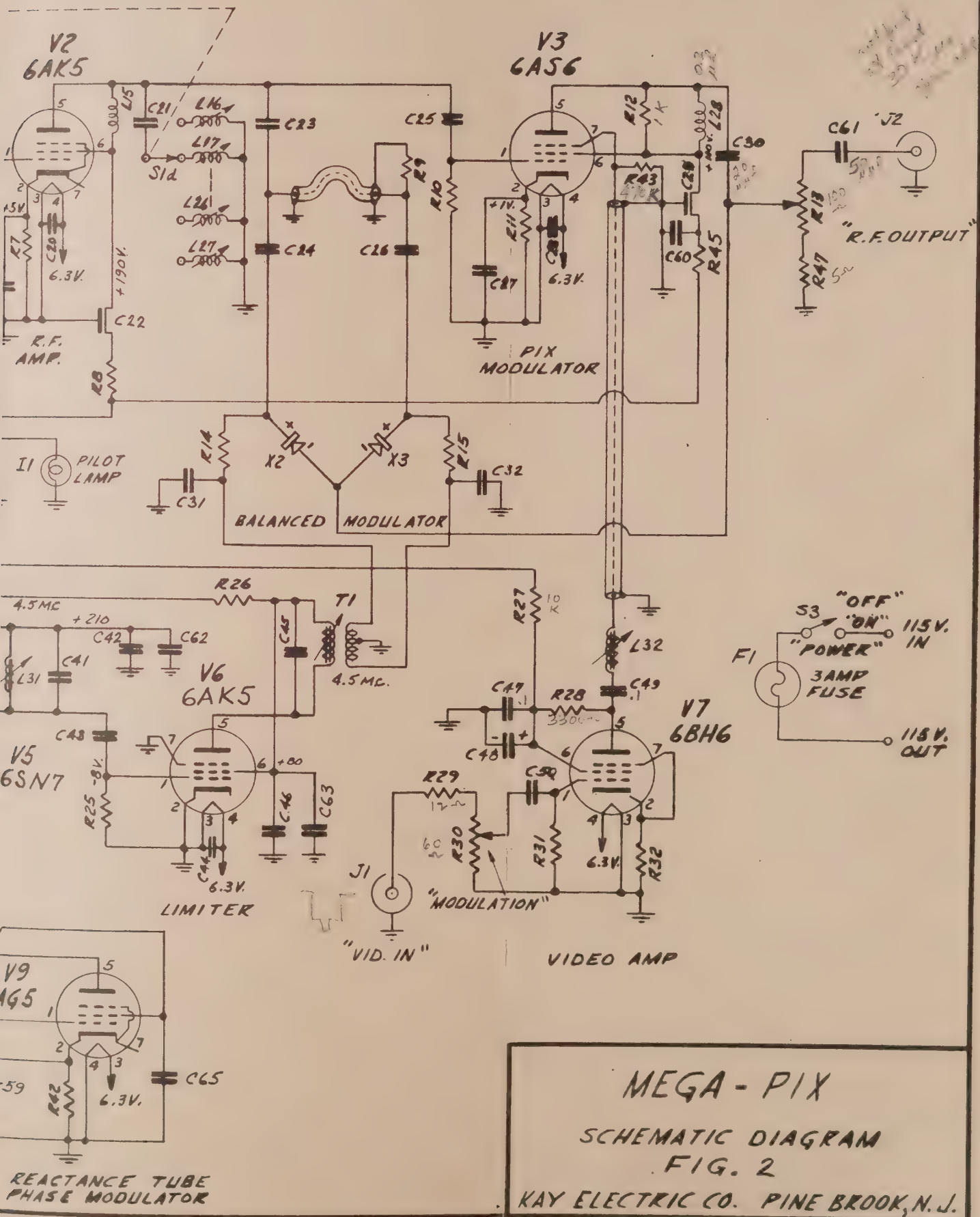


Fig. 1 Block diagram of the MEGA-PIX





PARTS LIST MEGA-PIX PANEL

Tubes

V1	6BH6
V2	6AK5
V3	6AS6
V4	6AG5
V5	6SN7
V6	6AK5
V7	6BH6
V8	6AG5
V9	6AG5

Resistors

R1	10 ohms	*	R26	28,000 ohms	2 Watt
R2	47,000 ohms		R27	10,000 "	1 Watt
R3	120 "		R28	3,300 "	
R4	10,000 "	2 Watt	R29	12 "	
R5	100,000 "		R30	60 "	Pot. MODULATION
R6	120,000 "		R31	470,000 "	
R7	1,000 "		R32	120 "	
R8	15,000 "	2 Watt	R33	1,800 "	
R9	75 "		R34	4,700 "	
R10	220 "		R35	39,000 "	
R11	100 "		R36	120,000 "	
R12	1,000 "		R37	390,000 "	
R13	100 "	Pot. RF OUTPUT	R38	1,000 "	
R14	1,000 "		R39	50,000 "	Pot. DEVIATION
R15	1,000 "		R40	1,800 "	
R16	10,000 "	2 Watt	R41	56,000 "	
R17	56,000 "		R42	1,200 "	
R18	10 "		R43	470,000 "	
R19	10 "		R44	330,000 "	
R20	100,000 "		R45	10,000 "	2 Watt
R21	330 "		R46	100,000 "	
R22	10,000 "	2 Watt	R47	5 "	
R23	10,000 "	2 Watt	R48	5,600 "	
R24	330,000 "		R49	10,000 "	
R25	10,000 "				

* All resistors 1/2 watt unless otherwise specified

Condensers

C1	10 mmf.	500 V	Ceramicon
C2	10 mmf.	500 V	Ceramicon
C3	1000 mmf.	500 V	Ceramicon
C4	10 mmf.	500 V	Ceramicon
C5 - C16	Channel 2 to 13 trimmers	500 V	
C17	400 mmf.	500 V	Button
C18	20 mmf.	500 V	Ceramicon
C19	1000 mmf.	500 V	Ceramicon
C20	1000 mmf.	500 V	Ceramicon
C21	1000 mmf.	500 V	Ceramicon
C22	400 mmf.	500 V	Button

Condensers - continued

C23	2 mmf.	500 V	Ceramicon
C24	50 mmf.	500 V	Ceramicon
C25	1.5 mmf.	500 V	Ceramicon
C26	50 mmf.	500 V	Ceramicon
C27	1000 mmf.	500 V	Ceramicon
C28	1000 mmf.	500 V	Ceramicon
C29	400 mmf.	500 V	Button
C30	20 mmf.	500 V	Ceramicon
C31	50 mmf.	500 V	Ceramicon
C32	50 mmf.	500 V	Ceramicon
C33	0.1 mf.	400 V	Paper
C34	470 mmf.	500 V	Mica
C35	80 mmf.	500 V	Mica
C36	80 mmf.	500 V	Mica
C37	10,000 mmf.	300 V	Mica
C38	230 mmf.	500 V	Mica
C39	1,000 mmf.	500 V	Ceramicon
C40	1,000 mmf.	500 V	Ceramicon
C41	91 mmf.	500 V	Mica
C42	10,000 mmf.	300 V	Mica
C43	10 mmf.	500 V	Ceramicon
C44	10,000 mmf.	300 V	Mica
C45	91 mmf.	500 V	Mica
C46	10,000 mmf.	300 V	Mica
C47	0.1 mf.	400 V	Paper
C48	20 mf.	450 V	Electrolytic
C49	0.1 mf.	400 V	Paper
C50	0.02 mf.	400 V	Paper
C51	820 mmf.	400 V	Mica
C52	300 mmf.	500 V	Mica
C53	80 mmf.	500 V	Mica
C54	25 mf.	25 V	Electrolytic
C55	0.1 mf.	400 V	Paper
C56	10,000 mmf.	300 V	Mica
C57	50 mmf.	500 V	Ceramicon
C58	5,600 mmf.	500 V	Mica
C59	0.25 mf.	200 V	Paper
C60	10 mf.	450 V	Electrolytic
C61	50 mmf.	500 V	Ceramicon
C62	10 mf.	450 V	Electrolytic
C63	10 mf.	450 V	Electrolytic
C64	510 mmf.	500 V	Mica
C65	0.1 mf.	400 V	Paper

Transformers

T1 Limiter output (10 mH. primary)

Coils

L1 50 microhenries
 L2 2 "
 L3 - L14 Channel 2 to 13 trimmers
 L15 22 microhenries
 L16 - L27 Channel 2 to 13 trimmers
 L28 0.2 microhenries
 L29 1.1 millihenries
 L30 100 microhenries
 L31 10 "
 L32 110 microhenries

Crystals

X1

X2

X3

X4 - X15

X16

1N34

1N34

1N34

Channel 2 to 13

180 kc

Germanium

Germanium

Germanium

Quartz

Connectors

J1

J2

Amphenol

Amphenol

VIDEO IN.

R.F. OUTPUT

Switches

S1 a,b,c,d

S2

S3

Rotary

S.P.S.T.

S.P.S.T.

TELEVISION CHANNEL

ON-OFF

Fuse

F1

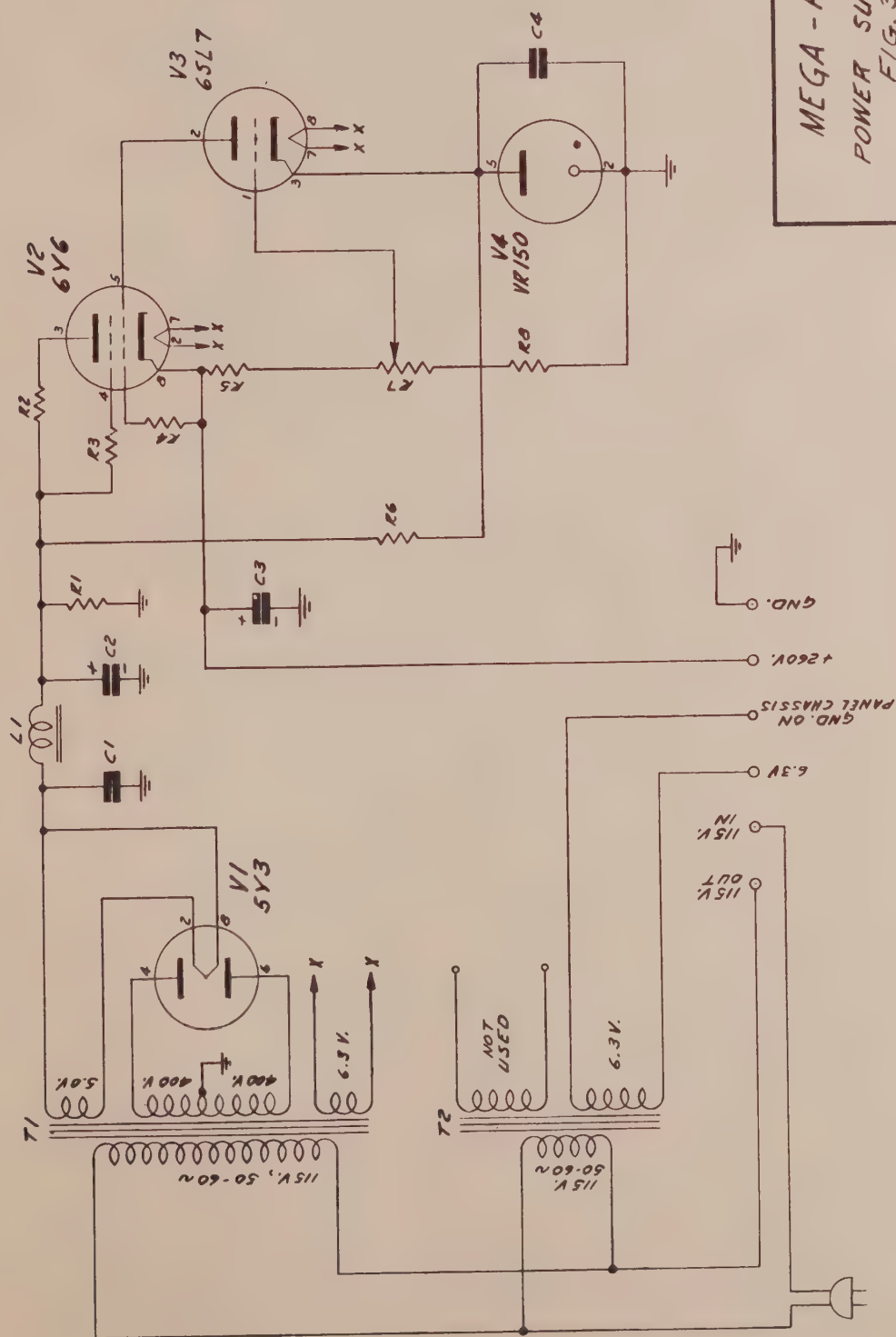
3 amp.

Pilot Lamp

I1

#47

Bayonet Type



MEGA-PIX
POWER SUPPLY
FIG. 3

KAY ELECTRIC CO. PINE BROOK, N.J.

PARTS LIST

MEGA-PIX POWER SUPPLY

Tubes

V1	5Y3
V2	6Y6
V3	6SL7
V4	VR150

Resistors

R1	330,000 ohms	1 Watt
R2	100 "	*
R3	100 "	
R4	27,000 "	
R5	47,000 "	
R6	22,000 "	5 Watt
R7	25,000 "	Pot. Output voltage control
R8	56,000 "	

* All resistors 1/2 watt unless otherwise specified.

Condensers

C1	2 mf.	600 v.	Paper
C2	20 mf.	450 v.	Electrolytic
C3	20 mf.	450 v.	Electrolytic
C4	0.5 mf.	600 v.	Paper

Transformers

T1	Power (115 volt pri.; 400-400 v., 5 v., 6.3 v. sec.)
T2	Filament (115 volt pri.; 6.3 v. sec.)

Coils

L1	10 H.	Iron core choke
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TABLE 1212 MAGNETIC FIELD DATA

Station	Time	Lat.	Long.	Alt.	Temp.	Wind	Clouds	Remarks
1	0100	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
2	0200	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
3	0300	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
4	0400	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
5	0500	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
6	0600	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
7	0700	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
8	0800	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
9	0900	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
10	1000	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
11	1100	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
12	1200	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
13	1300	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
14	1400	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
15	1500	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
16	1600	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
17	1700	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
18	1800	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
19	1900	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
20	2000	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
21	2100	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
22	2200	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
23	2300	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
24	2400	34° 15' N	122° 00' W	1000	55.0	010	0	Clear

All observations in this column of magnetic field data.

Station	Time	Lat.	Long.	Alt.	Temp.	Wind	Clouds	Remarks
1	0100	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
2	0200	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
3	0300	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
4	0400	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
5	0500	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
6	0600	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
7	0700	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
8	0800	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
9	0900	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
10	1000	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
11	1100	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
12	1200	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
13	1300	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
14	1400	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
15	1500	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
16	1600	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
17	1700	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
18	1800	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
19	1900	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
20	2000	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
21	2100	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
22	2200	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
23	2300	34° 15' N	122° 00' W	1000	55.0	010	0	Clear
24	2400	34° 15' N	122° 00' W	1000	55.0	010	0	Clear

